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ABSTRACT

Preservice teacher education, when viewed through a constructivist lens, should consider preconceptions because it is important that students be initially aware of their own attitudes and of the beliefs that they carry with them. Preconceptions also provide a reference point about which students may reflect as new meanings are acquired. This paper describes one aspect of an ongoing project involving preservice teachers and methods instructors at three Canadian universities over 2 years. The overall purpose of the study is to collect and analyze data relating to the conceptions held by preservice secondary science teachers about the nature of science, of teaching, and of learning. Data were collected in the form of three-phase questionnaires, interviews, and videotapes of class interactions. An interpretation of these data has been used in the development and piloting of some strategies aimed at promoting meaningful preservice instruction. Data described in this paper were derived from responses to one particular item on the questionnaire administered at the start of the 1-year teacher education program at the University of British Columbia (Canada). Preservice students were asked to provide metaphors for the teaching/learning process. Samples of the students' metaphorical statements are provided. (CW)

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"TUGBOATS AND TENNIS GAMES: PRECONCEPTIONS OF TEACHING AND LEARNING THROUGH METAPHOR"

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Paper presented at the annual meeting of the
National Association for Research in Science Teaching,
Atlanta, Georgia, April, 1990

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"The Great Book of the universe lies forever before our eyes but which we cannot read since we have not learned the script in which it was written"

Galileo

INTRODUCTION

Loosely defined, and stripped of all implication, "learning" can be seen as an "acquisition of knowledge". Complexity and the diversity of interpretations of this term arises from the multitude of viewpoints about what construes "knowledge" and what is the nature of an"acquisition" process.

Galileo's metaphor of the "Great Book" betrays his positivistic perspective of knowledge and reality. From that angle, science is seen as a pursuit leading to the exposure of ultimate truths lying beneath an objective reality, while knowledge is regarded as an understanding of the fruits of these discoveries which conform to the agreed-upon standards of a community of scholars.

An antithetical perspective (and the stance of this paper) is that of constructivism or relativism. "Reality" is seen as a conceptual rendering of experience, i.e. that which passes through the filter of human senses to be actively constructed through an interactive network of associations, language, symbols and tacit memories of prior experience. Knowledge is thus regarded as personal, dynamic, and necessarily context-bound. Had Galileo been a constructivist he might have described the Great Book as being written by ourselves; each of us composing a different version, written in our own personal languages and in a constant state of revision.

While a positivistic pedagogy (albeit a stereotypical one) is directed at imparting its version of knowledge unambiguously, a constructivist pedagogy is considerably more complex. Proponents of this view recognize that new learning is influenced by personal knowledge borne out of a student's prior experience. Osborne and Freyberg (1985) have documented a variety of alternate conceptions arising from children's prior beliefs that often lead to problematic alternate interpretations of new information. Driver(1987) and Posner et al (1982), among others, view learning as a modification of prior personal knowledge and is therefore contingent upon: 1. the recognition and identification of prior knowledge (termed elicitation

in this context); 2. the provision of significant (and sometimes counter-intuitive) experiences; and 3. subsequent opportunities to negotiate new meanings in a social context to provoke reflection and restructuring of concepts and connections.

A growing body of literature over the last ten years reports school-age children's prior conceptions about topics in many subject areas. Students' ideas about particular science concepts have typically been elicited using interviews and/or written instruments, commonly involving task-centered activities and problem solving settings for stimulated recall. (See, for example, Erickson, 1979; Watts, 1983; Schollum and Happs, 1982). When learning is viewed as conceptual change or *accommodation* rather than as mere *assimilation* with prior knowledge (Piaget 1951) the results from these kinds of studies may be seen to have clearly significant implications and utility for science instruction.

Little has been done, however, to explore the notions held by preservice teachers about the nature of teaching and learning. With reference to elicitation, Hewson and Hewson (1988) make an assertion which is central to the inquiry described in this paper.

> "It is at least reasonable to expect all pre- and inservice science teachers to have some conception of teaching science, because they will themselves have been taught over a period of some fifteen years and presumably will have thought about teaching before deciding to become a teacher." (p. 609)

In terms of preservice teacher education and when viewed through constructivist lenses, it is essential (and indeed interesting!) to tap into these prior ideas. Firstly, it is important that students be initially aware of their own attitudes and belief systems they carry with them into a course of instruction. Secondly, it provides a reference point about which the students may reflect as new meanings unfurl. Thirdly, it acquaints the instructor with the thinking of his/her students, both individually and generally, and may afford useful insights from which to plan purposeful instructional manoeuvres.

THE STUDY

The accompanying paper (Aguirre & Haggerty, 1989) describes one aspect of an ongoing project involving preservice teachers and methods instructors at three Canadian universities over two years. The overall

purpose of the study is to collect and analyze data relating to the conceptions held by preservice secondary science teachers about the nature of science, of teaching and of learning. Data were collected in the form of three-phase questionnaires, interviews and videotapes of class interactions. An interpretation of these data is leading to the development and piloting of some strategies aimed at promoting meaningful preservice instruction.

Data for the exploratory study described in this paper were derived from responses to one particular item on the questionnaire administered at the start of the one-year teacher education program at the University of British Columbia. Preservice students were asked to "Give your own **metaphor** for the teaching/ learning process." The entire instrument was intended as an elicitation device for the articulation of conceptions which were in place prior to any formal instruction of teaching and learning in science.

METAPHOR AND LANGUAGE

Driver & Erickson (1983) and Schon (1983, 1987) remind us that personal knowledge is deeply held, tacit and inarticulate. Any expression of these ideas as well as a subsequent interpretation thereof are therefore subjective and context-bound. Dewey (1944) refers to these prior and personal beliefs as a product of "original learning" and suggests that "learning... is not primarily cognitive." Garrison and Bentley (1990) weave the arguments of Dewey, Wittgenstein and Kuhn together to conclude that "the world-picture cannot be rationally learned." Quoting Wittgenstein, "the propositions describing this world-picture might be part of a kind of mythology. And their role is like that of rules of a game; and the game can be learned purely practically, without learning any explicit rules."

What, then, is the currency for communication if language is seen in this way as being inherently ambiguous? "Communication", (according to Encyclopedia Britannica, 1990) involves the "exchange of ideas through the use of a set of commonly agreed upon symbols." These symbols, Wittgenstein would argue, are not the words themselves but some elements of common human experiences with which the words are associated. He distinguishes between "first language" which is fundamentally experiential and tacit, and "second language" which is expressed through the translational medium of the first. Barker (1982) compares this to the learning English as a first

language and subsequently learning French "by connecting the new language to the language I already understand." (p 72)

It is my contention that metaphorical language stems close to the experiential roots of "first language", and an examination of personal metaphors reveals one's original world-views in a way that literal language cannot. I take issue with Entwistle (1970) who claims that "our educational theories would become sharper instruments, less liable to fallacy, if we could dispense with metaphors altogether." By virtue of the fact that literal language is specific and precise it is thus restrictive and perhaps paradoxically inadequate for the purposes of conveying meanings implicit in personal world-views. In fact an extension of Wittgenstein's notion that language is personally constructed from experience is the view that metaphor is a basic component of language itself. Peppered with metaphor, Taylor (1984) explains this nicely: "Language works by means of transference from one kind of reality to another. It is thus essentially rather than incidentally or decoratively or even illegitimately--metaphorical." (p 8) Elsewhere he says "metaphor... is the basis of the conceptual systems by means of which we understand and act within our world." (p. 5) Aspin (1984) regards metaphor as a basic feature of language. Quine (1979) concurs, claiming that "metaphor, or something like it, governs both the growth of our language and our acquisition of it." In fact it is extremely difficult to use language which is strictly literal and devoid of metaphor, particularly when attempting to articulate abstract concepts. Gombrich (1972) describes this notion with a lovely choice of metaphor; "Our language, in fact, favours this twilight region between the literal and the metaphorical. Who can always tell where the one begins and the other ends?"

Even in the positivistic realm of science, metaphor has powerful communicative value through its illustrative use in models and in its role in the conceptualization of theory. Consider the economy of expression yet richness of meaning in the metaphors of "black holes", "selfish genes", "light waves", "Big Bang" and "natural selection". Holton (1984) asserts that "in the work of the action scientist there are not merely occasions for using metaphor, but necessities for doing so, as when trying to remove an unbearable gap or monstrous fault." The scientist Thomas Young removed such a gap in explaining the physical distinctions between colours of light when he created a metaphor inspired by the different sounds emanating from a series of organ pipes. Charles Darwin developed his theory of natural selection based on Malthus' notions of competition for economic survival in capitalistic society (Bernal, 1969). Schon (1979) elaborates on the

utility of metaphor in problem solving, refering to the creation of parallel conceptualization as *generative metaphor*, that is, "a perspective or frame, a way of looking at things--and... a certain kind of process--a process by which new perspectives on the world come into existence." (p. 254) In a similar way, the common usage of metaphor as a descriptive linguistic tool is useful for the clarification, elaboration and extension of ideas in both communication and self reflection.

STUDENT METAPHORS

All 151 students preparing as secondary science teachers at the University of British Columbia in September 1988 and September 1989 were administered a questionnaire at the first meeting. The purpose of the instrument was to elicit their preconceptions about the nature of science, of teaching and of learning. (Aguirre et al, 1989). One hundred and thirty students responded to the question: "Give your own metaphor for the teaching/learning process."[1] of which 116 were considered suitable.

QUALIFICATION

In order to be considered "suitable" for the purpose of this analysis the metaphor had to satisfy these two characteristics:

1. That there was a non-literal *image* presented which made an implicit or explicit correspondence to the principal topic or to some properties of it. Phrased in the language of Black (1977) there must be a "duality of meaning" between a non-literal "secondary subject" and the "primary subject" which are related through an "implicative complex". Consider these examples.

> "Teaching is like raising a plant. Give it water (information) and sunlight (stimulation) and it will grow and mature."
>
> "The teaching/learning process is like the symbiotic relationship between corals and the plants that live within them. The plants capture energy from the sun and leak out carbohydrates to nourish the corals."

[1] An example of a metaphor unrelated to education was provided orally by the instructor in order to clarify the meaning of the term.

One obvious difference between these two statements is that, in the first case, the correspondence between the primary and secondary subjects is explicit and the metaphor is fairly transparent to the thinking which lies behind it. The second example, however, makes only implicit reference to the primary subject, at times creating simultaneously rich and ambiguous meanings. If I may use an implicit metaphor as a tool to analyzing one, I would say that a non-specific implicative complex is iridescent rather than opaque; rich and changeable in colour depending upon the angle from which one views it.

The following response is an example from thirteen which were disqualified as metaphors because of the lack of a secondary subject.

> "Presenting ideas and material in a logical manner, engaging students in question/answer of material, and giving assignments to complete to see if they have learned it."

It is thus a literal rather than a metaphoric statement .

2. That the primary subject be specifically related to the teaching/learning process. The following response is one of four which were identified as mis-targeted metaphors.

> "Lack of education in today's society is like only speaking English in a foreign country. You can get by but you miss out on a lot."

This particular metaphor targets the "role of education" as a primary subject rather than the teaching/learning dynamic, rendering it difficult to classify for the purposes of this inquiry.

CLASSIFICATION

Several elements were identified among the student metaphors which could be considered as categorization criteria. Among these are *image*, *mood*, and *theme*.

A. Image Certain images recurred frequently in this sample. Some version of "journeys" were common metaphors (16) as were "horticultural" metaphors (10) and "finding treasure". (6). In fact, at least twenty separate images were used by two or more respondents. However, it is readily apparent that the same image can be used to

illustrate quite different aspects of teaching/learning and from fundamentally different attitudes. The following examples illustrate such contradictory conceptions derived from parallel images:

> "It is like the shaping of a sculpture from a square block of marble. The person already has a lot of information, but as he learns why things occur or how it happens, this everyday knowledge takes shapes and gives new meaning to the learner."

> "A teacher is a sculptor molding others in his own image."

The first of these metaphors may be interpreted to mean that learning is seen as uniquely personal and actively constructed out of the learner's world experience. The entry conditions of the learner are respected. Using the same image, the latter reveals a view of learning as the product of a manipulative process where the learner is regarded as a passive object rather than an active subject of this process.

Hence, the similarity of the images as common attributes were considered to be at a level too superficial for purposeful classification. By making such comparisons, however, we are made aware of deeper and more subtle distinctions which will be termed "mood".

B. Mood As a subjective characteristic of a metaphor, an analysis of mood requires some interpretation on the part of the reader. Davidson ((1978) eloquently captures the flavour of this subjective characteristic.

> "Metaphor is the dreamwork of language, and like all dreamwork, its interpretation reflects as much on the interpreter as on the originator.The interpretation of dreams requires collaboration between a dreamer and a waker, even if they be the same person; and the act of interpretation itself is a work of the imagination. So, too, understanding a metaphor is an much a creative endeavour as making a metaphor, and as little guided by rules."

It seems almost paradoxical to want to objectify these same qualities of a metaphor that make them so rich. Translating a metaphoric statement into literal language is rather like explaining the

punchline to a joke, for the act of clarifying the meaning through specification consequently serves to make its meaning restrictive. Nevertheless, it is necessary to unpack these metaphors in order to develop a scheme to relate the conceptualizations of a diverse group of individuals into patterns

For the purpose of this study, and in relation to the teaching/learning process, mood is deemed to have three dichotomous dimensions identified as: *Effort* (active/passive), *Affect* (positive/negative), and *Control* (teacher centered/student centered).

1) *Effort*: refers to the extend to which teaching and learning is seen to be deliberate, and with the requirement of conscious involvement on the part of teacher and/or student. "Active" Effort usually involves the notion of a struggle and persistence in the face of setbacks, whereas "Passive" Effort implies an unconscious inevitability, usually as it applies to the learner. The endpoints of this dimension are illustrated without elaboration with the following examples taken from the study.

Active Effort

> "...like climbing a hill of sand. One is frequently sinking or sliding back down but progress is possible as long as one is not content to sink in a "comfortable" region along the way."

Passive Effort

> "Learning is like breathing--if one is alive, it is inevitable."

2) *Affect*: refers to the emotional aspect of teaching and learning. Some metaphors evoke the moods of optimism and satisfaction, while others allude to the frustration experienced by either teacher or student.

Positive Affect

> "Teaching is like turning on the lights and learning is realizing the lights are on, and slowly working towards waking up and opening your eyes. Once you learn something, you then become grateful that the lights are on."

Negative Affect

> "A mother spoon-feeding a young child--to have the food swallowed or spat back into her face."

3) *Control*: relates to the Effort dimension in that the subject to which notions of Active Effort (and therefore the one in whom the onus for student learning is seen to reside) is directly or indirectly identified as either the teacher or the learner. Teacher-centered Control is characterized by transmissive or manipulative activity by the teacher. Only benign cooperation is required of the student.

Teacher-centered Control

"Teaching is like throwing a snowball at a wall. Some of the snow sticks but most bounces back. It also seems that just throwing harder doesn't necessarily make more of the snowball stick."

"A teacher serves as a guide to a trail. The student is like a hiker new to that trail. The teacher can point out easier paths and pitfalls and must ensure the hiker makes the end of the trail."

Metaphors in the mood of Learner-centered Control frequently place the learner in an environmental setting. Conditions or experiences from such an environment are modified by the learner to generate uniquely personal outcomes. The teacher is frequently pictured as only one of the many characteristics of that environment.

Learner-centered control

"The teaching/learning process reminds me of crystals forming in a magma chamber. They acquire their particular habit from the physical and chemical properties of the magma (teacher) to form their own unique shape, growing ever larger."

"Like a hike along a mountain path. At every turn something new and interesting can be discovered."

The organization of this collection of metaphors is based on the premise that a useful classification scheme has a minimum of unclassifiable or cross-catagorized items. There are at least two difficulties which arise when attempting to use the primary attributes of mood to classify the entire sample into a system. Firstly, some particular aspect of mood is not always present in a metaphoric statement, or it might be neutral. Secondly, classification of any particular item possessing features of several dichotomies creates a

multidimensional matrix which is both complex and cumbersome. However, as a secondary characteristic the notions of mood will be shown to be legitimate attributes and will indeed be useful for the interpretation of metaphors.

C Themes refer to the fundamental and primitive images or root concepts residing in Wittgenstein's "first language" or Dewey's "original learning"(1926). Derived and distilled from images, they forge the basic common links between diverse metaphoric statements. For this reason, Theme was chosen as a primary criterion for the classification of this sample of metaphors. Grouped almost by "feel" it has in fact proved difficult to coin appropriate labels to each category due to personal connotations inherent in second language descriptives that inevitably lead to restrictive or unintended meanings.

THEMATIC CLASSIFICATION

Four themes were identified from these data and will be referred to as "*Delivery*", "*Change*", "*Enlightenment*" and "*Humanics*". It will be shown, as mentioned earlier, that several disparate images may be found under the same theme. For example, a "Delivery" concept of teaching and learning may be revealed through images of throwing, pouring, filtering, messaging, transferring, absorbing, feeding, filling, falling, giving or carrying. Although the specific images evoked are variable, there is a basic primitive element which is shared among them and which provide the foundation for grouping within the same theme.

A. Delivery describes a system of uni-directional transference, usually of information from teacher to learner. That information is seen as largely unchanged through the transfer process although it is often incompletely received.

"Teaching is like the job of a messenger."

"... like electron transfer through collision between molecules..."

"..can be seen as water being poured on a sponge..."

"A student can be a hog eating the nutritious myriad found in the slop of life... force feeding is not uncommon..."

Some kinds of selectivity results in the discrepancy between what is "known" in a public or positivistic sense and what the student ultimately learns. This may be as a consequence of *choice* (either by the learner or the teacher) or *chance* as seen in the following excerpt.

Learner choice

"..like the rain falling from the sky--some people choose to get wet, others hide beneath an umbrella"

Teacher choice

"The teacher acts like a coarse sand sifter that filters out the undesirable chunks of useless or unnecessary material."

Chance

"... like a lottery..."

"Filtering" was a common allegory for describing the selective outcomes of teaching and learning. Like the "teacher as coarse sand sifter" example above, the following metaphors illustrate images related under this theme.

> "Like a filter feeder (a Baleen Whale). Filter out and absorb the important constituents (concepts, facts). Don't fill up on water (get weighted down by the bulk of the subject matter)."

> "..like making maple syrup. After pouring 40 gallons of sap into a hot pot, if you're lucky you are left with one gallon of rich syrup."

One student makes the connection between teacher choice in planning and learner choice in learning with reference to salesmanship.

> "Teaching is like marketing--it's not how good the product (knowledge) is, it's how you package(convey) it."

Note also the different notions of "Control" moods which are evident in these examples

B. The theme of Change centers on the view that the learner becomes different in some way as a consequence of learning. These differences are modelled on either "growth" or "transformation" metaphors.

Horticulture is a common vehicle for growth metaphors. The student is consistently portrayed as a growing plant, whereas the teacher is seen as either a benign source of solar energy (passive) or a caring and dedicated gardener (active).

> "The teaching experience is like the sun giving energy to plants or seeds to develop and grow, and eventually blossom into a fulfilled and more informed organic entity."

> ""Teaching is like being a gardener and watching a young seedling grow into a beautiful flower. Learning is being that flower and growing strong because of the love, care and nutrients that gardener provides."

Other growth images include crystals, building a wall or house, smoldering embers ("burning slowly but ready to burn brightly at any time") and money in the bank ("the more you put into it, the more you get out of it.") In each of these examples growth is dependant upon the support of the learning environment. In two unique examples, teaching is portrayed as a support system but growth or change is neither stated nor implied.

> "Teaching provides the rock for students to stand on"[2]

> "The educational process is like the living cells of a body...we, the teachers are the organs. The kids are the cells."

Throughout this class of metaphor the Affective mood is positive whereas Control and Effort are generally teacher-centered and passive.

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[2] In this example there is a degree of ambiguity which results from
1. the unexpressed reference to a primary subject, and
2. the use of the work "provides" which can either be taken to mean "is" or "gives".
It is unclear, therefore, if the "rock" is a metaphor for the teacher or for foundational knowledge that is gained.

A second kind of Change, although not always distinct from growth[3], involves "transformation" where the product of the learning process is different from and inevitably better than the input.

> "Metamorphisis from caterpillar to butterfly."

> "The teacher, like the sun, radiates her knowledge in beams onto the faces of her pupils, or plants. Some plants wither and die, others convert this energy into food which can be assimilated to enhance further life."

> "Teaching is to learning as electricity is to a stereo... if (there is a) normal, steady supply, something beautiful has the opportunity to be produced."

In contrast to the positive mood depicted by the friendly images in the previous examples, several transformation/change metaphors reflect a view that conformity is a desirable outcome of instruction, and that educational goals can be attained through manipulation and Teacher-centered Control.

> "Teaching is like cooking; you need the correct ingredients and supplies and do it in the proper order. Hopefully you can stomach the results."

> "...the obtainment of power over knowledge. The taming of a wild beast to befriend it and have it work for you on your side."

> "...like a stream meeting a larger river. The stream is the learner and the river is the teacher."

C. Enlightenment encompasses the images of journey, discovery, illumination, vision, clarity, exploration, and treasure-hunting. The common, primitive element to metaphors classed under this theme is the concept that there is a preexistent 'quality'--either valuable knowledge or some hidden potential of the learners themselves--which becomes revealed through learning.

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[3] Although plants grow, many will also "bloom".

The "journey" metaphor was commonly used but it was interesting to find such a wide diversity of moods within the sample. For example, the journey may be depicted as a solitary trek by the learner into an enriching environment...

> "A hike along a mountain path. At every turn something new and interesting can be discovered."

> "The teaching/learning process is like travelling to a foreign country, where one experiences many difficulties and frustrations, yet finishes with a sense of satisfaction having experienced many pleasant and exciting adventures, and having become that much more knowledgeable."

or a trip where the traveller is accompanied by a guide (typically the teacher). Note the difference in the Control mood between these next two examples:

> "The ideal teacher is a guide who points the student in the direction of the knowledge and shows the student how to attain that knowledge."

> "You see Star Trek? Well in teaching the teacher leads others boldly (one hopes) into new worlds and facilitates their discovery of things they have never known before."

In the latter case the reader is directed to the fact that the captain "facilitates" (rather than "leads") the journey into uncharted realms. It is significant that the "new worlds" are equally unfamiliar to captain and crew. Drawing on another metaphor, the captain/teacher is a "mediator" of discovery. In contrast, the guide in the first metaphor knows both the destination and the well-travelled route leading to it.

At another extreme, teachers may be portrayed as rather aggressive guides.

> "Teachers are tug boats, tiny but strong, pulling the giant ships of society's youth towards knowledge and understanding that will allow them to survive in the ocean of the future."

That the goal is usually rewarding suggests a Positive Affective mood. The concept of "reward" tends to be regarded as

either a tangible treasure which can be uncovered with the investment of some effort...

> "The teacher as miner using the proper tools of the trade searching and bringing out precious gems or minerals that he knows are there"

or the gift of new vision...

> "...like the role of an optometrist: you take a piece of raw glass and slowly alter its optical properties so that the wearer of the glasses sees the world more clearly."

> "If the subject is a black, lifeless envelope; the teaching/learning process is slowly opening that envelope to find something colourful emerging and developing as the envelope is pushed farther and farther back."

> "...removing clouds of fog..."

D. The Humanics theme has a strong mood components and is variable in its scope. Metaphors under this class tend to imply that teaching and learning is regarded by their authors as a personal, and very human activity. Images involving interaction, exchange, struggle and persistence are recurrent. This theme is epitomized by the following example:

> "Watch a parent and child as the child takes its first steps--the parent stands back, the child wobbles forward, the parent claps, the child claps, the child begins to fall, the parent moves forward to offer support with a hug and plenty of praise."

Neither the parent (teacher) nor the child (learner) is seen to do it in isolation from the other. The abilities reside in the learner, but the importance of the teachers' role in providing support, encouragement and feed-back is highlighted.

The image of a "transaction" conveys this meaning by drawing a metaphor of mutual exchange for mutual benefit.

> "...similar to a commercial transaction with a buyer and seller. Instead of receiving goods or services, the student gains knowledge and the teacher gains the satisfaction of passing on that knowledge rather than receiving money."

Symbiotic relationships, two-way streets, a balance scale, horse and rider ("one is lost without the other") and games are further interactive metaphors used to convey similar meaning.

> "...a tennis match. There is a continual interchange between teacher and student. Occasionally, the teacher smashes the ball too hard or the student hits the ball out of bounds. However, after a brief interuption of play, the exchange continues."

The nature of the learner-to-teacher response is typically either in the form of feedback about the learning status of the student (seen in the "tennis game" metaphor above) or it is unspecific beyond general notions of sharing or exchange. One student, demonstrating the richness and potency of a well-chosen metaphor, conceptualizes the cooperative and interdependent nature of the teacher/learner relationship.

> "... is like a two-person three-legged team where one person (teacher) knows the way to the finish line (hopefully the best way)--legs tied together, keep close together yet both partners affect each other by their progress and direction. They must pay attention to each other."

The "struggle" component of the Humanics theme conveys a powerful Effort mood, and the images within the metaphors suggest the need for either cooperation of the learner or persistence on the part of either the teacher or learner if successful learning is to occur.

> "Teaching is like trying to put on a wet suit. It's difficult but you can do it if you persevere. Learning is like someone else trying to get you to wear a wet suit. You'll only do it if you want to."

> "You can bring a horse to H_2O but you can't make it drink."

> "Any metaphor for the teaching/learning process would have to include patience on the side of the teacher and general apathy on the part of the learner all taking place in a

complex environment. How about combing one's hair while walking into the wind."

METAPHORS AND ATTITUDE

There were four metaphorical statements which were especially puzzling. Due to the omission of any explicit references to a primary subject, the literal meanings are difficult to extract. But if not exactly transparent, they are at least translucent to the underlying themes and moods. Each is worth a moment of study for the richness of personal meaning they contain. The personal nature of these images revealed through their passive, learner-centered and somewhat negative moods them led me to class them under the Humanics theme.

"Watching a movie on flying versus actual flying."

"Helping an individual see the other side of the moon so he/she knows what it looks like if he/she ever goes there"

"Learning process is like the clouds in the sky--it is constantly changing, sometimes it moves very quickly, other times hardly at all. Sometimes they are dark and mysterious, yet other times they are white and enlightening."

"Set them up and knock them down."

It is of course true that non-literal statements--and that includes metaphors such as these which lack an explicit reference to the primary subject--may introduce an element of ambiguity[4]. Recalling Davidson's earlier comment we are made aware of the creative

[4] Empson (1930) defines ambiguity as "any verbal nuance, however slight, which gives room for alternative reactions to the same piece of language." "Set them up and knock them down" could as easily refer to the accomplishment of solving problems and overcoming obstacles as to the demoralization of defeated students. However if one considers that all language and word meanings are bound up in personal and therefore not universal contexts, it must be argued that all language --even so-called "literal language" if such a thing exists-- is prone to ambiguity.

aspect of both the interpretation and the composition of metaphoric statements. Nonetheless, it is evident to me that, fundamentally, these metaphors convey personal *attitude* about teaching and learning beyond the students' conceptualizations of the process itself. What glares through the imageries are the deeply rooted feelings of individuals who, although now preservice teachers, are still viewing the enterprise through the eyes of experienced, long-time students. They convey messages of bitterness as passive learners; of the bewildering irrelevance of curriculum content that they have endured; and of the manic-depressive nature of the learning experience which seems to straddle the states of confusion and enlightenment.

Metaphoric commentaries such as these effectively communicate the student's *Weltbild* --Wittgenstein's "world picture"--forged from the wealth of prior experience as a learner in formal settings. Several researchers have shown how these conceptions can profoundly influence one's sense-making of subsequent learning experiences (Osborne, Bell and Gilbert, 1982). Further, we are alerted to the contribution that these residual "learner" attitudes--consisting of consisting of values, emotional reactions, dispositions and the way schooling is regarded--have on preservice conceptions of teaching and learning. In addition to but apart from prior concepts, attitudes are significant components of that world picture.

SUMMARY

Black (1977) writes about the inextricable inter-relationships among language, perception, knowledge, experience and metaphor. An extension of this, grounded in Wittgenstein's notion of the symbolic, experiential basis of "first language", is the view that metaphors are windows into this primitive, personal framework. The purpose of this paper is to take an exploratory look at preservice teachers' metaphors of teaching and learning and to examine some components of student teachers' own intuitions in this area.

A fairly consistent pattern of conceptualization emerges from one sample of metaphoric statements. Based upon the primary criteria of "deep" images or *themes*, student teachers tend to view the teaching/learning dynamic as a process of *delivery*, *change*, *enlightenment*, or *humanics*. At a more primitive "gut" level, these themes might be more simply expressed as "give/getting", "finding", "becoming" and "trying"

Within each theme there are different expressions of *mood* which expose the students' perceived roles of teacher and student, personal attitudes, and perspectives on the nature of knowledge, which likely stem out of their own history as long-time students.

In the light of constructivist pedagogy, the elicitation of students' preconceptions is seen to be germane to the organization of learning experiences. Firstly it recognizes that existing beliefs have some influence on the meanings that one constructs from new learning experiences. Secondly, insight into the nature of this intuitive knowledge provides a basis for the organization of either specific or generic teaching strategies leading to the fulfillment of intended outcomes. Thirdly, a student's self recognition of prior knowledge furnishes a reference point upon which they can reflect as learning progresses.

The value of metaphor has thus been demonstrated for its use in conceptualization (such as the construction of scientific models), problem solving (what Schon calls "generative metaphors") diagnosis of learner preconceptions (elicitation), and as a rich communication device. Communication that is referenced to our common base of shared images and sensations can be thought of as tapping directly into the repository of human experience. Further, there are certain, inexpressible, aesthetic qualities to good metaphor which, like an artform, a line of poetry or the product of any other creative act, cannot be satisfactorily translated into literal terms. To do so would be to compromise their intent. These constructions convey a richness that is enhanced through their interaction with both the producer and interpreter in ways that are as uniquely personal as ourselves.

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STUDENTS' METAPHORIC STATEMENTS

A. DELIVERY

1. ABSORPTION

Teaching is like the job of a messenger. Learning is...

The t/l process is like electron transfer through collision between molecules - often a change event, but we can increase the likelihood of it happening from 20% to 99.99% by improving the reaction conditionsthat favor completion.

The educational process is like the living cells of a body. there is an exchange of energy (knowledge) the cell matures, replicates, and another cell is born. it is constantly "soaking up" more food/energy through its membrane which is from the organ it is a part of. We, the teachers, are the organs. The kids are the cells. How's that for a metaphor!

Students and knowledge are like sponges and water respectively. Under the right conditions they will soak up everything, but lean on them too hard and it is all lost.

Teaching is like pouring water on a sponge. If it's a good sponge and in the right condition and place, it will absorb some of the water.

...can be seen as water being poured onto a sponge. The teacher provides the water (knowledge) which is absorbed (learned) by the student.

Teaching is like pouring tea - if the cup thinks it is full, it will not accept any more tea.

Sun rays radiating to the planets where the sun is the teacher and the rays are ideas and concepts being projected to the planets and then being absorbed by each planet. Some planets will absorb more than others.

(I'm emperical, not literary, but O.K. I'll try)
A student can be (a) hog eating the nutritious myriad found in the slop of life. Although force-feeding is not uncommon, unfortunately, find the best flavours! (sic)

...a mother spoonfeeding a young child - to have the food swallowed or spat back into her face.

What goes in, must sooner or later come out.

2. FILTERING

Like a filter feeder (a Baleen Whale) Filter out and absorb the important constituents (concepts, facts). Don't fill up on water (get weighted down by the bulk of the subject matter.)

The teacher acts like a coarse sand sifter that filters out the undesirable chunks of useless or unecessary material. The student must sift through these materials and pick out the grains of knowledge that they will retain and or use.

The process is like filtering,

pouring in a large amount of material and working to ensure (and hoping) that the pore sizes are large enough to allow a substantial amount of the information (to) get through to the student.

...making maple syrup. After pouring 40 gallons of sap into a hot pot, if you're lucky you are left with one gallon of rich syrup.

3. CHOICES

Teaching is giving an opportunity, learning is taking the opportunity.

Like the rain falling from the sky - some people choose to get wet, others hide beneath an umbrella.

4. RANDOM

The t/l process is like a lottery. Nothing is absolute, but if you win the prize you would gladly buy another ticket.

T is like throwing a snowball at a wall. Some of the snow sticks but most bounces back. It also seems that just throwing harder doesn't necessarily make more of the snowball stick.

5. MARKETING

T is like marketing - it's not how good the product (knowledge) is, it's how you package (convey) it.

B. ENLIGHTENMENT

1. JOURNEY (SELF DISCOVERY)

"Going where no man/woman has gone before." (As a teacher you are helping to open up and develop new areas of a student's mind.) (As a student you are learning new concepts and ways of thinking that you haven't been exposed to before)

Teaching is often like walking down a street. As one walks down a street one meets and discovers new challenges, stimuli and problems but a calm, observant and purposeful step will always help.

Learning is like an intellectual adventure in which a student starts at a certain point, not really knowing the ultimate destination, but on the way experiences many good times and many difficult times, all of which are enjoyable (and looked back on in later life as very valuable, rewarding and simulating)

Teaching is similar to committing yourself to a ten day wilderness hike. It is physically and psychologically unpleasant for the entire 10 days but when it is over you have learned a lot, shared a lot and you are very glad you went along.

The T/L process is like travelling to a foreign country, where one experiences many difficulties and frustrations, yet finishes with a

sense of satisfaction having experienced many pleasant and exciting adventures, and having become that much more knowledgeable.

It is like kayaking down a river canyon. The canyon is the teacher and the paddler is the student. The canyon has a lot of information to convey. It is up to the paddler to absorb it and utilize it in a positive fashion.

2. GUIDED JOURNEY
Friendly persuasion (?) Leading a person with the hope that they will see something from a new perspective.

Teachers are tug boats, tiny but strong, pulling the giant ship of society's youth toward knowledge and understanding that will allow them to survive in the ocean of the future.

.. trying to find a hotel in a strange city, say Bangkok. You can bump around and find a place to stay by yourself. This is being self taught. Or you can use a map and ask others for help and guidance. This role as a "guide" is the role of a teacher. With a teacher you can get there faster, and you'll get there for sure.

It is like showing a friend from another country and culture your city.

..being in a continuously branching road. As a teacher there are many roads that can be taken to arrive at the same point. As a learner the choice of paths need to be narowed to lead to a conclusion or diversified to all for more experiences.

.. a long road trip; if you, the driver, just rush straight to the destination, your passengers are bored and indifferent. If you make many interesting stops along the way, they will enjoy the trip and may want to come with you again.

Learning is like a journey that never ends, and teaching is like road signs, maps and other navigational aids (eg the guy at the gas station who could make the directions very easy or very difficult)

The student is an explorer and the teacher is his guide-one who is familiar with most of the area to be explored.

A teacher serves as a guide to a trail. The student is like a hiker new to that trail. The teacher can point out easier paths and pitfalls and must ensure the hiker makes the end of the trail.

The ideal teacher is a guide who points the student in the direction of the knowledge and shows the student how to attain that knowledge.

You see Star Trek? Well in teaching the teacher leads others boldly (one hopes) into new worlds and facilitates their discovery of things they have never known of before.

.. a prospector with a guide. The teacher can guide the students as to what questions to ask and how to solve them but the nuggets mined contribute to the students' wealth of knowledge. The better the guide, the richer the students.

3. DISCOVERY
The T/L process is like opening Pandora's Box-and hopefully learning to contend with what we find there, and appreciate it rather than be horrified by the complexity.

T/L process is like looking for a gold mine and finding one-developing it into a mine only to lust for another mine! (To teach, to learn, and once knowledgable, to know more.)

A hike along a mountain path. At every turn something new and interesting can be discovered.

The teaching/learning process is like a treasure chest-once you open it you encounter all sorts of new and wonderful things.

The teacher as miner using the proper tools of the trade searching and bringing out precious gems or minerals that he knows are there.

4. ILLUMINATION
It is like the old Ford commercial, the TV screen is in darkness. Suddenly the light comes on and the voice says "Ford has a better idea". In other words, the student has little understanding of the subject at hand, the teacher introduces the subject, and eventually the light comes on.

Teaching is like turning on the lights and learning is realizing the lights are on, and slowly working towards waking up and opening your eyes. Once you learn something, you then become grateful that the lights are on.

I would say it is something like the role of an optometrist: you take a piece of raw glass and slowly alter its optical properties so that the wearer of the glasses sees the world more clearly.

Teaching is the removal of clouds of fog from about the learner so that at first he gains knowledge and understanding of what is immediate to him and then the boundaries are pushed back farther and farther.

If the subject is a black, lifeless envelope; the t/l process is slowly opening that envelope to find something colourful emerging and developing as the envelope is pushed farther and farther back.

C. CHANGE

1. GROWTH (HORTICULTURE)
T is to L what the plant roots are to the stem. Without the roots the plant would not be able to reach to the light and grow, it would remain small and unchanging until it died. But with roots the plant grown tall and strong, branching out here and there and eventually flowering.

.. is like an oak tree which begins as a seed, each year growing, rooting in a foundation of knowledge, with branches expanding in curiosity, complexity and height.

The T experience is like the sun giving energy to plants or seeds. This energy is converted to food (for thought) which supplies the essentials for the seed to develop and grow, and eventually blossom into a fulfilled more informed organic entity.

The sun is the teacher and the plant is the student. The more rays of knowledge the plant soaks in the bigger and more beautiful it grows.

Teaching is like raising a plant. Give it water (information) sunlight (stimulation) and it will grow and mature.

Teaching is pouring water on a withered plant i.e. it enables the plant to grow and become more than it was before.

The process is like growing a tree. If the teaching is done well and the environmental conditions are good, then the learning will grow and eventually bear fruit.

Teaching is like nurturing a young plant or animal. You provide a good learning/growing environment for the students, and all the care/commitment you are able to give, and students should flourish and grow and learn.

Like watering and fertilizing a plant until it blooms.

T is like being a gardener and watching a young seedling grow into a beautiful flower. Learning is being that flower and growing strong because of the love, care and nutrients that gardener provides. (Corny!)

The learning process is like the fertilizer that helps a seedling grow into a full blooming flower.

2. GROWTH (NON-HORTICULTURE)
The T/I process is like a stream meeting a larger river. The stream is the learner and the river is the teacher.

Perhaps something like a wall in time. The support provided by the lower bricks in the wall represents the structure and knowledge provided by the teacher to the student - which are the next level of bricks. These, too, become the support for the subsequent layer.

..reminds me of crystals forming in a magma chamber. They acquire their particular habit from the physical and chemical properties of the magma (teacher) to form their own unique shape, growing ever larger.

.. a smoldering coal, burning slowly but ready to burn brightly at any time.

T is like money in the bank, the more you put into it, the more you get out of it.

3. GROWTH (CONSTRUCTION)
A metaphor is cooking. The teacher is the recipe and the students are the ingredients. Both are required to make a cake just as students and teachers are required for a successful learning process.

Teaching is like cooking, you need the correct ingredients and supplies and do it in the proper order. Hopefully you can stomach the results.

.. baking a cake. All the ingredients must be in the right proportions, the oven must be on and the baker paying attention. The cake - a success is like having learnt an idea - can be utilized and shared.

Perhaps like building something (a house?) One has to do things in an orderly/logical manner, and there are established ways of doing things in order to be successful (i.e. build walls before roof). It is a gradual and accumulative process.

The learning process is like an inverted pyramid such that you start at the bottom which is the tip and work up to a large understanding. There are a few basic ideas which must be mastered and on these through various interconnections the whole body of science rests with all of it's broad reaching implications.

4. TRANSFORMATION
A teacher is a sculptor molding others in his own image.

The obtainment of power over ignorance. The taming of a wild beast to befriend it and have it work for you on your side.

..a substance which can exist in different phases (solid, liquid, gas) as external conditions are changed. The environment can have a major impact on the result of the process and the same "substance" can be so different.

It is the shaping of a sculpture from a square block of marble. The person already has a lot if information, but as he learn(s) why things occur or how it happens, this everyday knowledge takes shapes and gives new meaning to the learner.

Metamorphisis from caterpillar to butterfly.

The teacher, like the sun, radiates her knowledge in beams onto the faces of her pupils, or plants. Some plants wither and die, others convert this energy into

food which can be assimilated to enhance further life.

T is to L as electricity is to a stereo. If there is no power going in, nothing of any consequence comes out. If improper power supply, garbage comes out. If normal, steady supply, something beautiful has the opportunity to be produced.

D. HUMANIC

1. INTERACTIVE

Watch a parent and a child as the child takes its first steps–the parent stands back, the child wobbles forward, the parent claps, the child claps, the child begins to fall, the parent moves forward to offer support with a hug and plenty of praise.

A completed/successful transaction. Like punching information you want to be conveyed into a computer and the computer spitting out a printed copy of the completed task.

Teaching is to learning as the tree is to the fruit. Each grows together, but to bear the most fruit the tree has to be pruned now and again.

..much like symbiosis in nature, whereby two distinct individuals live very closely together, both benefiting from each other by some form of sharing, yet not always appearing to enjoy the process.

..similar to a commercial transaction with a buyer and seller. Instead of receiving goods or services, the student gains knowledge and the teacher gains the satisfaction of passing on that knowledge rather than receiving money.

..a two way street in that those teaching must want to and those learning must also want to learn.

.. the symbiotic relationship between corals and the plants that live within them. The plants capture energy from the sun and leak out carbohydrates to nourish the corals.

..is a two-way street. As information is driven out to the learner by the teacher, the learner must also drive back some feedback to indicate his understanding of the material.

I'm better at analogies than metaphors. Teaching is learning. T/L is like a horse and rider. One is lost without the other.

.. is like a two person 3-legged team where one person (teacher) knows the way to the finish line (hopefully best way)– legs tied together keeps close together yet both partners affect each other by their progress and direction. They must pay attention to each other.

It is like a tennis game–the teacher serves the information (or skills) to the student, and the student returns it, which allows the teacher to know that the student understood the information.,

..a tennis match. There is continual interchange between teacher and student. Occasionally, the teacher smashes the ball too hard or the student hits the ball out of bounds. However, after a brief interuption of play, the exchange continues.

Initially, it is like an hour glass where the information and ideas are passed on to the students (like sand flows into one side of the hour glass) Following, the process is like a balance or a scale where ideas, questions and answers are exchanged between students and the teacher. However, it is never a one-sided discussion but agive and take situation for everyone involved.

Active transport between teacher and student.

2. EFFORT

Like a sailboat in the wind. The teaching being the wind applied to the sail. The learning being the sail and the learner the boat. The teaching only is as effective as the sail is put into the wind.

The T/L process can often be like using a battering ram to enter a castle when the side door is wide open.

.. a river flowing down stream. It may be resisted but if strong enough it will eventually reach even the most extreme corners of the river bed.

.. the steady drip of water hitting a stone. Each drop of water makes little difference but over the years, collectively those drips grind a hole in the rock.

..climbing a hill of sand. One is frequently sinking or sliding back down but progress is possible, as long as one is not content to sink in a "comfortable" region along the way.

"Beating oneself into satisfaction." from "beating a crocodile into submission." Corocodile Dundee.

.. is like cheap liquor, at first it's hard to swallow, then it gets easier, then you start to like it, then you're addicted.

Teaching is like trying to put on a wet suit. It's difficult but you can do it if you persevere. Learning is like someone else trying to get you to wear a wet suit. you'll only do it if you want to.

You can bring a horse to H_2O but you can't make it drink. If it wants to, it will drink. You can only encourage along the way to the watering hole.

..trying to make a bull's eye, sometimes you will have to reinforce an idea/topic, more

than once or twice in order for the students to understand it.

...can be likened to backcountry skiing--a tremendous effort is required to get to the top of the mountain (learning the concept) but once on top, heading downhill is easy.

Any metaphor for the t/l process would have to include patience on the side of the teacher and general apathy on the part of the learner all taking place in a complex environment. How about combing one's hair while walking into the wind.

Teaching is similar to committing yourself to a ten day wilderness hike. It is physically and psychologically unpleasant for the entire ten days but when it is over you have learned a lot, shared a lot and you are very glad you went along.

Turtles are the best teachers, they show you how to crawl step by step.

3. (COMMENTARIES / MIS-TARGETED METAPHORS)
Helping an individual see the other side of the moon so he/she knows what it looks like if he/she ever goes there!

Learning process is like the clouds in the sky--it is constantly changing, somethimes it moves very quickly, other times hardly at all. Sometimes they are dark and mysterious yet other times they are white and enlightening.

Watching a movie on flying versus actual flying.

Set them up and knock them down.

...is like trying to tell someone something is good for them and they don't believe it.

Teaching is like parents. Once you think you know all there is to know about it you learn something new.

Teaching is for the love of it. (Not exactly a metaphor, but it is the closest I could think of)

Teaching is like being a parent in fast forward, you have your kids for only a few months, and in that time they go from uninformed students to (hopefully) knowledgable students. You are kind, yet firm, and you become good friends, and then you let them go into the harsh world of the next grade.

...a game. The teacher tries to reach the students, give them information, help them learn and understand it and want to learn more. It is a challenge that the teacher can't afford to lose, for the students sake. The teacher also gains valuable experience from this "encounter".

...a bottle of wine. It gets better with age and its enjoyment or benefit is finally "uncorked".

The T/L process is a merry-go-round, with its up and downs, spiralling to the top of a never ending tower.

... should be like Beaver Cleaver asking his Mom and Dad all of the questions Wally could not answer.

Teaching provides the rock for students to stand on.

A child walking. A child learns to walk through teaching and the child's own observations.

Lack of education in today's society is like only speaking english in a foreign country. You can get by but you miss out on a lot.

Learning is like breathing--if one is alive, it is inevitable.

LITERAL

The student does the learning. The teacher helps by creating opportunities for this to occur and motivating the student to take advantage of these opportunities. "Doing is usually more important than hearing."

A student learns by "doing", and by recognizing the concepts being taught and being applied in their normal sphere of reality--in their everyday world. A teacher asssits a learner by reminding him/her of their innate curiosity and by providing him/her an organized framework to exercise this curiosity and discovery.

Presenting ideas and material in a logical manner, engaging students in question/answer of material, and giving assignment to complete to see if they have learned it.

A teacher is a source of information, a communicator, and a motivator of his/her students.

The teacher should have definite goals and objectives. He /she should consider initially student's beliefs, should try and use a variety of approaches and materials, should involve students in the activitys discussion, should entertain inquisitive minds.

The learning process is life, for life without learning isn't really much of a life at all. As the most complex thinking organisms of earth (humans), learning should be as important as the basic necessities of sustenance.

Repitition and interest on the student's behalf.

Cooperation.

Being reflective and decisive enhances capability.

To try to make someone understand something by visual, verbal and "doing it" means.

END

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